

BIOLOGICAL EVALUATION OF PINE BARK BEETLES
ON THE ENOREE RANGER DISTRICT, SUMTER NATIONAL FOREST

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ABSTRACT

An aerial survey (194,237 acres) and ground check on the Enoree Ranger District, Sumter National Forest, indicate that southern pine beetle (SPB) (*Dendroctonus frontalis* Zimm.) activity is increasing. Forty-nine spots were located within the District boundaries, and 30 of these were on Forest Service land. Susceptible host type covers 65,900 acres of land (.46 spots per thousand acres of host type).

INTRODUCTION

An aerial survey of the Enoree Ranger District, Sumter National Forest, was conducted on August 16, 1982 by the Forest Pest Management Aerial Survey Team (Bassett, 1982).

Since the early 1960's, the Enoree District has experienced three SPB epidemics. The first peaked in 1967 and collapsed the following year. By 1970, SPB populations had peaked again, only to collapse the following year. At the peaks of both of these epidemics, there were five or less SPB spots per thousand acres of host type. Southern pine beetle activity remained low until 1979. The 1979 evaluation found approximately 4 spots/1000 acres host type, and most of these spots had more than 50 trees (Hoffard and Ghent, 1979). As with the other outbreaks, this last one rapidly collapsed the following year (personal communication).

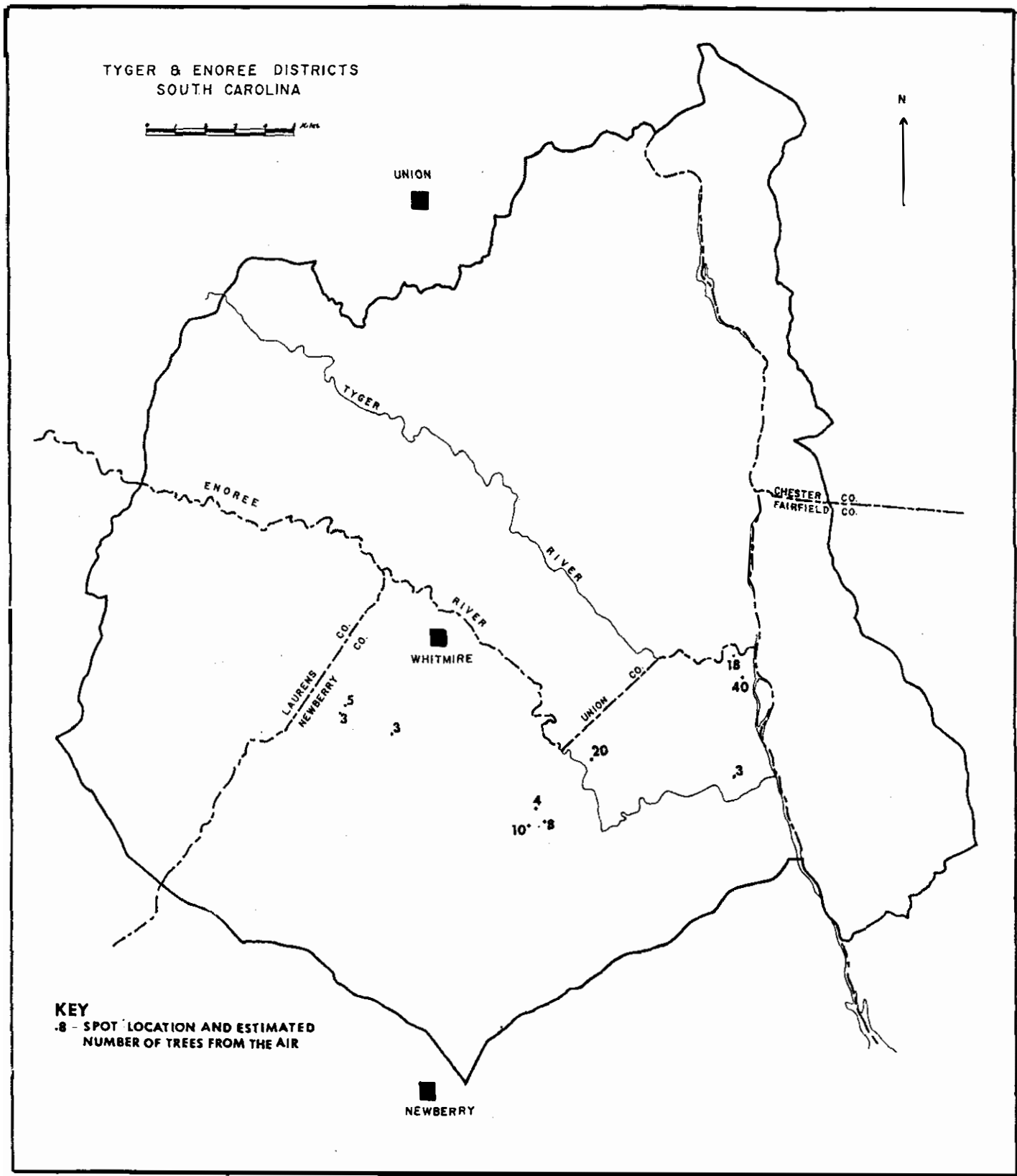
This evaluation was conducted to determine the present status and trend of SPB populations on the Enoree District. Entomologists from Forest Pest Management, Asheville Field Office, and District personnel conducted the evaluation on August 31 through September 1, 1982.

METHODS

Standard sketch mapping procedures were used in the aerial survey. Two observers each viewed a strip .5 mile wide. The flight lines were spaced one mile apart, resulting in a 100 percent survey. Spots of fading and/or red trees and the estimated number of trees per spot were recorded and plotted on Class "A" Forest Service maps of the District.

Ten of the aerially detected spots were selected to be ground checked. Sample spots were selected to represent the spot size (number of trees) distribution from the aerial survey. The map in Figure 1 shows the spots which were sampled and the number of trees estimated in each spot from the air. At each

Figure 1.--The locations of the spots sampled for the biological evaluation on the Enoree Ranger District, Sumter National Forest, 1982.



spot, the causal agent was identified, and the number of infested and vacated trees by crown color (green, fading, red, or black), diameter and height of the first 20 trees, basal area, and average age were recorded.

RESULTS

The aerial detection survey located 49 multiple tree spots within the District boundary. Thirty of these were on Forest Service land, and 19 were on private land. Table 1 shows the distribution of spots by ownership and spot size category. The Enoree District has 65,900 acres of pine forest, which converts to .46 SPB spots per thousand acres of host type.

Of the 10 spots ground checked, 8 contained infested trees. Thus, 80 percent of the sampled spots were actively infested by SPB. If it is assumed that this is representative of the situation over the entire District, then 24 spots are active.

The actively infested spots ranged in size from 5 to 94 trees. Most of the active spots were also infested with black turpentine beetles (BTB) (*Dendroctonus terebrans* Oliv.). The ratio between green:red infested trees ranged from 4:1 to 13:1. Large ratios, like these, indicate that the spots are active and expanding. The data collected at the sample spots are summarized in Table 2.

The volume of timber killed by SPB in the sampled spots totalled 7,560 ft³. Forty-six percent of the volume killed is currently infested by SPB; indicating moderately active SPB populations (Figure 2). A small portion (451 ft³ or 6%) of the volume sampled was infested by BTB.

The criteria used to determine whether or not an area qualifies for special suppression project funds include the number of SPB spots per 1,000 acres of susceptible host type and the green infested:red infested tree ratio. One multiple tree spot per 1,000 acres of susceptible host type has historically indicated the lower threshold of an SPB epidemic. The green tree:red tree ratio indicates how fast the SPB spot is expanding. Therefore, these two measures are used, along with economic evaluations, to justify special project funding.

The current level of SPB activity on the Enoree Ranger District is insufficient to justify a special suppression project. However, Forest Pest Management will continue to maintain contact with the District and recommend continued aerial surveys and ground checks as needed.

For recommended controls and preventive measures, refer to the following sections.

CURRENT SUPPRESSION PROCEDURES

1. Removal of Infested Trees by Commercial Sale. When infested trees of merchantable size are accessible, they should be removed by commercial sale. Logging of the infested material should begin immediately. Contract time limits should insure rapid removal.

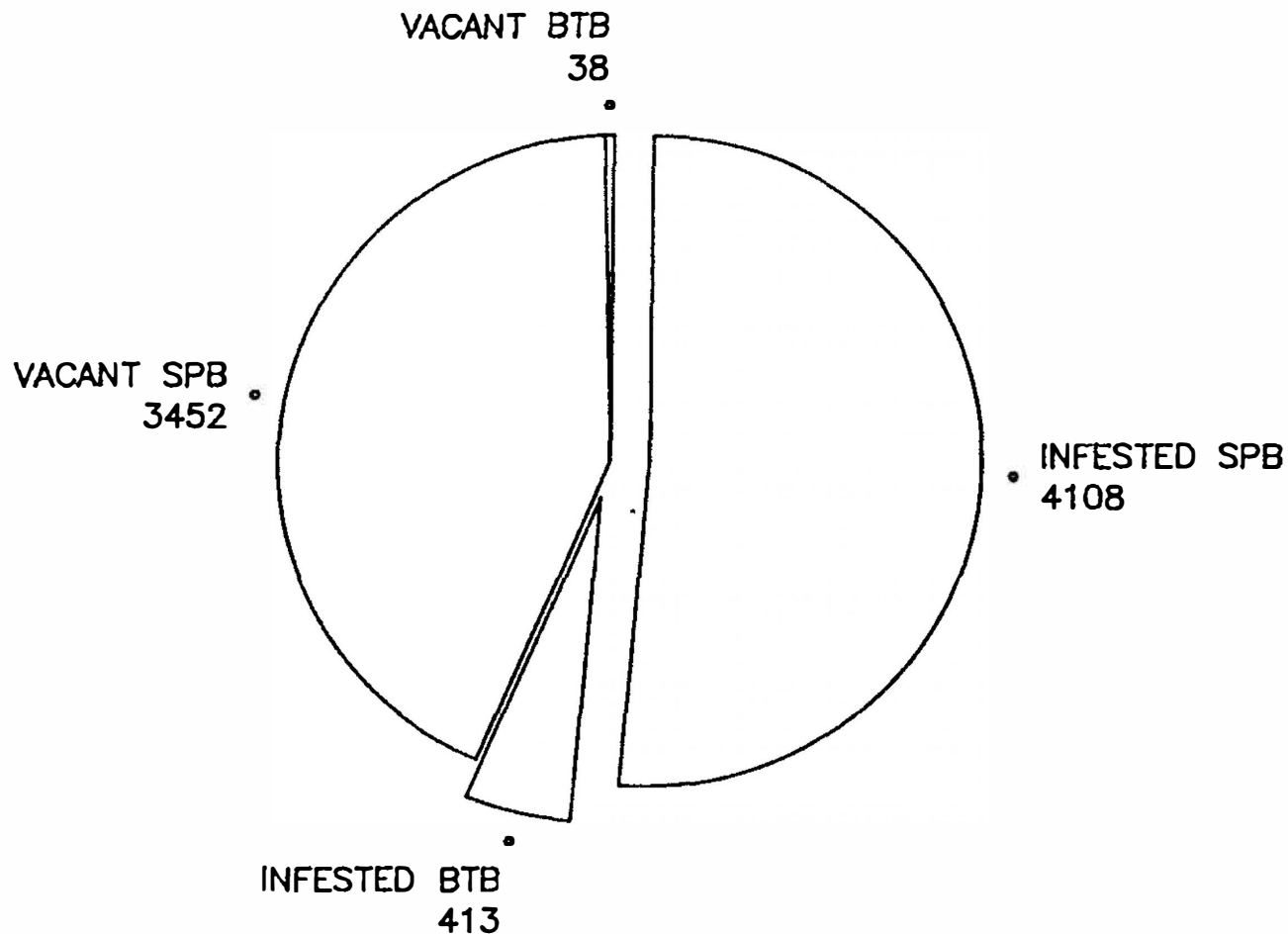
Table 1.--Summary of aerial survey data, Enoree Ranger District, Sumter National Forest, August 16, 1982.

Ownership	Infestation Size (# trees)					Total
	3-5	6-10	11-25	26-50	51+	
	Spots	Spots	Spots	Spots	Spots	Spots
Federal	20	5	3	2	0	30
Private	11	4	3	1	0	19
Total	31	9	6	3	0	49

Table 2.--Summary of ground check data for the Enoree Ranger District, Sumter National Forest, August 1982.

Spot #	Causal Agents	Aerial Size	Vacated				Infested			% Infested	Green:Red Ratio	Basal Area	\bar{x} dbh/ \bar{x} ht	\bar{x} vol.	4th ?
			Green	Red	Black	Total	Green	Red	Total						
1	SPB	18	0	1	0	1	4	1	5	83	4:1	80	12.7/52	19	0
2	SPB BTB	3	0	1	3	4	5	0	5	56	5:0	80	17.2/73	44	0
3	SPB BTB	40	1	11	24	36	54	4	58	62	13.5:1	70	16.9/80	51	24
4	SPB	20	8	0	7	15	12	0	12	44	12:0	50	12.6/65	25	0
5	SPB	3	0	2	3	5	0	0	0	0	0	60	11.8/48	16	
6	SPB BTB	5	0	3	9	12	4	0	4	25	4:0	110	13.7/65	28	0
7	SPB BTB	3	1	2	0	3	3	0	3	50	3:0	50	17.0/44	28	0
8	SPB	3	0	5	0	5	0	0	0	0	0	80	9.7/47	10	0
9	SPB BTB	4	0	6	0	6	0	1	1	14	0:1	130	15.4/74	38	0
10	SPB BTB	5	3	3	0	6	13	1	14	70	13:1	50	15.9/88	51	0

FIG. 2 — — SAMPLED AFFECTED TIMBER BY
CONDITION (CUBIC FEET) , 9/1/82



SUMTER NATIONAL FOREST
ENOREE RANGER DISTRICT

When practical, and if host type is present, a 40- to 70-foot buffer strip should be marked and cut adjacent to and ahead of the most recently infested trees. This practice is effective in reducing the possibility of "breakouts." When only a small volume of infested, merchantable material occurs in a spot, noninfested trees surrounding the spot may be marked to provide an operable cut.

The order of priority of removing beetle-infested timber from a spot should be as follows:

- Trees in the buffer zone at the head(s) of the spot; if not removed within two weeks of marking, another visit and tally must be made in order to insure removal of all infested trees and an adequate buffer strip.
- Trees with fresh attacks and having young broods (usually the green, recently infested trees).
- Trees having nearly developed broods (usually the red and fading trees).

Remove infested trees from National Forest lands by commercial sale or administrative procedures in accordance with guidelines and procedures set forth in FSM 2400 through 2490.

2. Piling and Burning. Unmerchantable or inaccessible SPB infestations can be suppressed by cutting, piling, and thoroughly burning the bark of infested trees. The entire bark surface must be thoroughly burned to insure effective control. The order of priority for cutting, piling, and burning infested trees, particularly the large spots, is the same as paragraph (1) under "Removal of Infested Trees by Commercial Sale." Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts," every effort should be made to locate and treat all green infested trees during the piling and burning operation.

3. Chemical Control. One chemical formulation recommended for SPB control is a one-half percent Lindane spray, with water as the carrier. This may be formulated from a 20 percent Lindane emulsifiable concentrate at the rate of 11 pints of concentrate in enough water to make 55 gallons of spray. (Ratio of one part 20 percent Lindane EC to 39 parts water).

Dursban® (chlorpyrifos) is also registered for SPB control. It is available as a liquid, containing 4 pounds of insecticide per gallon of concentrate. The spray is prepared by mixing 2-2/3 fluid ounces of concentrate with water to make 1 gallon or 2.1 gallons of concentrate in 100 gallons of water. Dursban®, a restricted-use pesticide, is to be applied only by or under the supervision of a certified pest control operator or other trained personnel responsible for insect control programs.

Cut, limb, and buck all infested trees into workable lengths. Spray the infested bark surface to the point of runoff. A compressed air sprayer (3-gallon capacity or equivalent) is an ideal applicator. Infested logs must be turned two or three times to insure complete treatment of infested bark. Spray stumps and bark removed by woodpeckers. Low pressure sprayers may be used to treat large, accessible infestations.

The order of priority for cutting and spraying infested trees in large spots is the same as paragraph (1) under "Removal of Infested Trees by Commercial Sale." Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts," every effort should be made to locate and treat all green infested trees during the chemical control operation.

Never spray trees from which SPB brood has emerged. Natural enemies of the SPB in these trees can then complete their development.

Instructions for minimizing the adverse effects of mixing, transporting, and storing pesticides, applying pesticides, and disposing of pesticide containers and excess chemicals are outlined in Section 8.3 of the Forest Service Health and Safety Code FSM 5242.21.

4. Cut-and-leave. This control tactic reduces losses from spot growth and proliferation during the summer months. Cut-and-leave is designed to disrupt spot growth in small- to medium-sized spots (40 active trees) by dispersing emerging beetles. These spots can be salvaged when markets or weather permit. Trees are still suitable for sale months after felling.

The following procedure is to be followed when using cut-and-leave:

- (1) Identify all active trees within the spot.
- (2) Fell all active trees toward the center of the spot.
- (3) Fell a horseshoe-shaped buffer of green, uninfested trees around the most recently attacked trees at the head of the spot and leave them lying on the ground with crowns pointed toward the center of the spot. The buffer should be as wide as the average height of the trees in the stand.

Cut-and-leave treatments should only be applied during the summer months between June and October. Spots with 10 or more infested trees should be treated first. As time permits, spots with less than 10 infested trees should also be treated if they contain trees with fresh attacks. In these smaller infestations where a specific head is not distinguishable, an adequate buffer strip (equivalent to the average height of the stand) and all infested and green, uninfested trees within the spot should be felled.

Re-examination of Treated Areas. Re-examine areas where infested trees were removed by commercial sales, piled and burned, chemically treated, or cut and left within 2 or 3 weeks after treatment to check for additional infested trees. If additional trees are found, treat them.

In any area where infested trees are cut for chemical control or piling and burning, or removed through commercial sales and administrative use procedures, stumps adjacent to living pine trees should be treated to control or prevent the root rot Fomes annosus.

In stands that have been previously thinned or have had a history of F. annosus infection, the stumps should be treated with the competing fungus, Phlebia gigantea.

In stands that have no history of F. annosus and have never been thinned, the stumps should be treated with borax.

Southern pine beetle infested tree stumps cut during the period of May through August, and below 34°N latitude, do not have to be treated with either of the above materials. This is because few spores are formed during this period and high temperatures often kill spores that are produced. However, routine summer thinning in areas of SPB buildup is not recommended.

PREVENTIVE MEASURES

The preceding represents only short-term, immediate control strategies. Preventive measures form an important part of the integrated pest management process. Some of the more significant preventive measures include:

1. Preventing or minimizing littleleaf disease, a condition which predisposes these weakened trees to beetle attack. Depending on severity of infection, diseased trees may be removed during normal thinnings on a 6-year cutting cycle or as soon as merchantable. In high-hazard areas or when replanting known littleleaf sites, use loblolly pine or a more resistant tree species, as opposed to shortleaf pine.
2. Harvesting mature and overmature stands. Such stands are vulnerable to beetle attack and should be harvested as soon as possible.
3. Thinning stagnated stands. Overstocked stands are low in vigor and are more likely to be attacked. They should be thinned to a point that trees again show thrift and vigor.
4. Minimizing impact of natural disturbances which causes stand stress. These factors include ice, wind, hail, animal damage, flooding, erosion, poor soil fertility, etc. Corrective measures include removal of individually damaged trees, wholesale salvage, improving drainage, fertilization, etc.
5. Minimizing or eliminating man-caused disturbances. Logging, pipeline, sewerline, powerline, or other construction activities require use of heavy equipment, which causes tree skinning and soil compaction and significantly weakens trees. Efforts to minimize the damaging consequences of these activities can significantly reduce the possibility of their leading to SPB problems.

PRECAUTIONARY PESTICIDE USE STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key--out of the reach of children and animals--away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registration of pesticides are under constant review by the U.S. Department of Agriculture, consult your county agricultural agent or state extension specialist to be sure the intended use is still registered.

REFERENCES

- Bassett, R. F. and E. T. Wilson. 1982. Aerial detection survey of forest insect and disease activity, Sumter National Forest, S.C. USDA Forest Service, S&PF, FPM, Doraville, Ga. Rep. No. 82-3-39.
- Hoffard, W. H. and J. H. Ghent. 1979. Biological evaluation of southern pine beetle infestations on the Francis Marion-Sumter National Forests, S.C. USDA Forest Service, S&PF, FPM, Asheville, N.C. Rep. No. 79-1-42.

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